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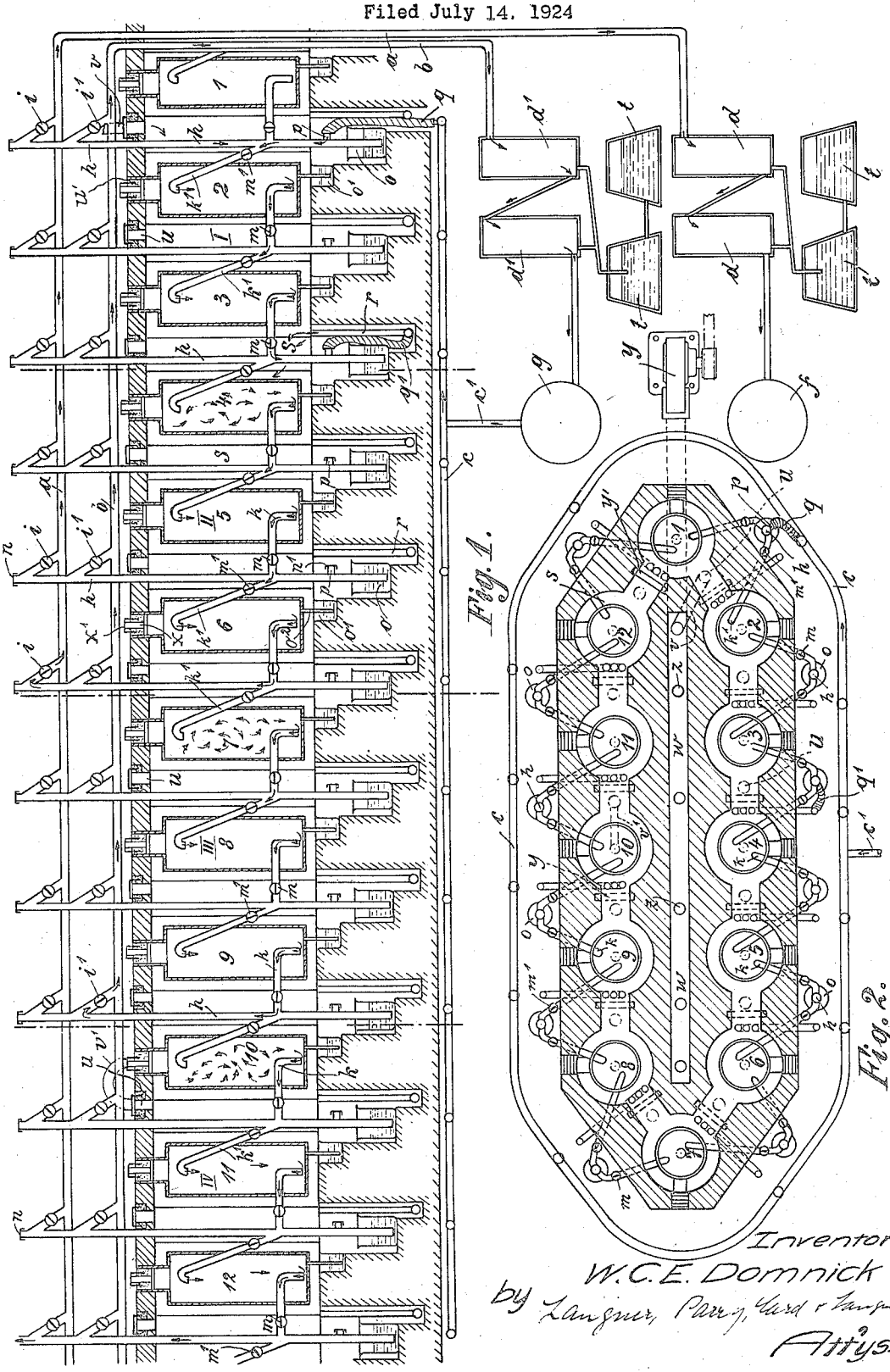


Fig. 1.

Fig. 2.

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CARBONIZING APPARATUS.

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The present invention refers to a furnace for distilling or expelling volatile matters from fuel of any description more particularly peat. The apparatus comprises a series of retorts which are preferably arranged in an elliptical order within a chamber which is common to all, the main object being to construct a furnace of this kind which can be operated with the least costs possible. The retorts for the sake of fractionation can be subdivided into zones or groups, the fractionation being carried out by a special system of pipes. This system of pipes is so arranged, that the gases of medium value produced within the retorts as well as the gases of high value, and also the gases which are not combustible and therefore of least value are separated from one another, and the gases of medium value are used for heating the furnace by being introduced into the common heating chamber, so as to be burnt therein. Having passed a certain number of retorts, that is to say the retorts in which gases of high value and also those in which gases of medium value are produced, the gases of combustion are cooled down to a certain extent, and then are introduced into the next following retorts, in which they remain to expel all watery constitutents, the gases of combustion being no more hot enough to chemically decompose the material. This invention is based on the understanding, that the gases of high value are created at a higher temperature and the poor gases at a lower temperature, which are used for operating the furnace, and finally that when having passed the retorts producing valuable gas the gases of production are cooled down to such an extent that they can be safely brought in contact with the fuel being carbonized. With this object in view the system of pipes is so constructed, that every single retort can be connected with every longitudinal pipe of the system, and also can be disconnected at will. In this case a plurality of retorts standing one behind the other can be connected to groups which are independent from the other retorts or groups of such, and the divers groups will then be connected with the pipes in different manner, so as to lead away the noncondensed gases of various composition.

In the drawing Fig. 1 is a diagrammatically vertical section of the furnace the divers retorts being shown in one row for better explaining and understanding the invention, and

Fig. 2 is a horizontal section of the furnace the retorts being shown here in an elliptical or annular arrangement.

The furnace shown in the drawing by way of example consists of twelve retorts, however, it is to be understood, that the invention is not limited to this number of retorts since a greater or smaller number might be chosen. The system of pipes for the furnace consists of two longitudinal pipes a and b for leading away the gases produced and a third pipe c that may be considered a return-pipe. These three pipes are adapted to be connected with the retorts in a suitable manner as will be more fully explained below. The pipe a serves for leading the gases of high value to a reservoir f while passing coolers d. The longitudinal pipe b leads gases of less value to the reservoir g also passing coolers d'. This reservoir g is connected with the longitudinal pipe c by a branch pipe c'. Means are provided for connecting the longitudinal pipe c with any one of the retorts.

The connection of the pipes a and b with the divers retorts will be carried out by vertical pipes h which are connected with these two pipes in any desired manner in the connections of which valves i and i' respectively are arranged. A branch pipe k connects the vertical pipe h with the neighbouring retort leading down to its bottom and the branch pipe k' connects the vertical pipe with the next following retort leading up to its top. In these branch pipes there are also valves m and m'. Caps or covers n may close the upper end of every vertical pipe which opens out into the atmosphere when the cap is removed or opened. The lower end of the vertical pipe reaches down into a vessel o, so as to accumulate the condensed tarry substances from the gases passing through the vertical pipe. The tarry substances accumulated in this vessel at the same time form a seal for this pipe. Above the vessels o the vertical pipes h have branches p, which generally are closed by caps n'. By flexible pipes q any of the branch pipes p can be connected with the

longitudinal pipe c at will. Below every retort there is a second vessel o' into which projects a drain-pipe o^2 connected with the bottom of the retort to allow the liquids of condensation of the retort to be drained. It remains to remark, that moreover pipes r are provided which open out into the common chamber of the battery next to every retort without however being connected with the retort itself, but the lower end of these pipes is adapted to be connected with the branch pipe p of the vertical pipe h, after removing the cap n', by a flexible pipe q'. The said vessels o and o' and their contents serving at the same time as a seal may also be called safety valves.

In the construction shown the heating chamber s, which is common to all retorts, has openings u on top, which are normally closed by sand seals u', but may serve to make communication by a connecting pipe v with an air pipe or channel w having similar openings z also normally closed. Into the air channel w atmospheric air is forced by a blower y of any known construction. Thus by connecting any opening z of the channel w with an opening u of the heating chamber s compressed air can be driven into the chamber at any place desired.

The operation of the furnace is as fol lows:

In the position of the valves shown it is taken, that the retort 1 is completely out of action and therefore can be charged with the fuel to be distilled. To put this retort out of action the valves i, i', m, m' belonging to the retort are closed, so that neither gas can escape from this retort into the longitudinal pipes nor any gas from any pipe can enter the retort. In other respects by the positions of the valves the furnace is so subdivided, that the retorts 2 and 3 form one group, the retorts 4, 5 and 6 form the second group, the retorts 7, 8 and 9 form the third group, and the retorts 10, 11 and 12 form the fourth group. By the flexible pipe q the pipe c is connected with the branch pipe p of the first vertical pipe h after removing its cap n'. The valve m' of the branch pipe k' leading to the retort 2 is opened as well as that leading to the retort 3, while the branch pipe k' leading to the retort 4 is closed. The valves m in the branch pipes k leading to the retorts 2 and 3 are opened. Consequently gas from the reservoir g passes through the pipes c', c and the flexible pipe q into the lower end of the vertical pipe h and by the corresponding branch pipe k' into the retort 2, where it is heated by the heat still prevailing in the retort, and at the same time cools down the contents of this retort. The retort 2 is also cooled from outside by air entering the heating chamber s by the opening u intermediate of the retorts 1 and 2, this opening u being connected with the next opening z of the channel w by a pipe connection v. The gases passing through the retort 2 are then led on by the corresponding pipes k and k' into the retort 3, and finally are led from this retort by way of the branch pipe k, belonging to the last named retort into the lower part of the corresponding vertical pipe h. From the branch pipe p of the last named vertical pipe h the cap n' is removed, and this branch pipe connected with the neighbouring pipe r by the flexible pipe q', so that the gases heated by the contents of the retorts 2 and 3 can here enter the heating chamber s, where they are ignited, when contacting or mixing with the air, that has entered the heating chamber s intermediate of the retorts 1 and 2 by the pipe v as described above, the air being preheated by having passed the retorts 2 and 3. The flames contact with the retorts 4, 5 and 6 of the second group. The valves m and m' intermediate of the retorts 4 and 5 are open, and also the next following valve m is then opened, while the valve m' of the pipe k' leading into the retort 7 is closed. The vertical pipe h between the retorts 6 and 7 is connected with the pipe a by the corresponding valve i and of all the valves belonging to the pipe a this is the only one that is open, so that the gases which are developed in the retorts 4, 5 and 6 escaping from one retort to the other are finally led by the said open valve i of the pipe a into this pipe. Since the retorts 4, 5 and 6 receive the greatest heat the gases developed in this second group are those of highest value, therefore by way of pipe a they are led into the reservoir f passing through the cooler d. Any liquids of condensation that might condense are drained into vats t. In the third group the retorts 7, 8 and 9 develop gases of minor value, since the gases of combustion washing round these retorts, though still hot, are no longer burning with flames. Here also the valves m and m' between the retorts 7 and 8 and 8 and 9 are open, and also the valve of the branch pipe k leading away from the retort 9 is open, while the valve m' of the branch pipe k' leading to the retort 10 is closed. The corresponding vertical pipe h communicates with the pipe b by the corresponding open valve i', all other valves i' of this pipe b being closed. Consequently the gases developed in the retorts 7, 8 and 9 of less value pass into the pipe b and from here into the reservoir g preparatory to being used according to need in the plant. These gases also pass coolers d' allowing liquids of condensation to enter vats t below these coolers.

The gases of least value, which are developed in the retorts 10, 11 and 12 of the fourth group will be allowed to escape into the atmosphere either by the corresponding

vertical pipes h being all open on top, or only the vertical pipe of the last retort having its cap n removed, so as to allow the gases from the first of these retorts to pass also through the next following retort. The reason that these gases are allowed to escape into the atmosphere is that they mainly consist of steam.

In order to effectively drive out the watery constituents of the gases remaining in these last named retorts 10, 11 and 12 the gases of combustion, having been cooled down by passing the retorts 7, 8 and 9 sufficiently, are now led into one of the retorts 10, 11 or 12, say the retort 10. This object in view all retorts have openings x on top normally closed by sand seals x'. To connect the retort 10 with the heating chamber s its opening x after removing its seal is connected with the next opening u of the heating chamber s by a connecting pipe v'. Thereupon part of the gases of combustion enter the retort 10 from above and force their way through the fuel within, heating this fuel without decomposing it on account of being sufficiently cooled. From the retort 10 the gases are led by its outlet pipe k and by the inlet pipe k' of the retort 11 into this retort, and in similar manner also into the retort 12 heating the contents and driving out the watery constituents. Finally by way of the outlet pipe k and the vertical pipe h of the last named retort 12 the gases escape into the atmosphere, the cap n of this vertical pipe h being removed and the corresponding valve m' being closed.

When the furnace has been worked for a certain length of time in the manner described above, during which time the retort 1 has been emptied and charged anew, the position of the valves has to be changed, so as to allow the chamber 1 to be included into the circuit and the chamber 2 to be shunted off, while for the divers groups one of the retorts is cut out of one group and connected with the next following group. Also the flexible pipes q and q' will be taken away, and used for making connection with the next following pipe, so that the operation of the complete plant will be shifted further for one single retort. In the position of the valves shown the heating commences between the retorts 3 and 4, air entering by the opening u intermediate of the retorts 1 and 2 as has been explained above.

Normally open doors or slides y' are provided in the heating chamber s intermediate every two retorts, one, preferably between the last retort and that being emptied and recharged, being closed as shown.

I claim:

1. A carbonizing apparatus, comprising, a series of closed retorts, a heating chamber common to all the retorts, a gas reservoir, a first system of pipes connected to each retort and arranged to convey gas of high value produced in the retorts into the gas reservoir, a second system of pipes connected to said first system to separately convey gas of lower value produced in the retorts to the common heating chamber, and valves in the systems of pipes for connecting the retorts in consecutive order with the two systems of pipes.

2. A carbonizing apparatus, comprising a series of closed retorts, a heating chamber common to all the retorts, high and low value gas reservoirs, two longitudinal pipes each communicating with one of the reservoirs and each connected with any of the retorts, a third longitudinal pipe connected with the low value gas reservoir, and means for connecting the third pipe with the retorts.

3. A carbonizing apparatus comprising, a series of closed retorts, a heating chamber common to all the retorts, a high value gas reservoir and a low value gas reservoir, two longitudinal pipes each communicating with one of the reservoirs, means to connect the pipes with any of the retorts, a third longitudinal pipe connected with the reservoir for gas of low value, means to connect the third pipe with any of the retorts, a vertical pipe for every retort, branch pipes on each vertical pipe, one of which leads to the bottom of one retort and the other of which leads to the top of the next following retort, and valves in the branch pipes.

4. A carbonizing apparatus comprising, a series of closed retorts, a heating chamber common to all the retorts, a high value gas reservoir and a low value gas reservoir, two longitudinal pipes each communicating with one of the reservoirs, means to connect the pipes with any of the retorts, a third longitudinal pipe connected with the reservoir for gas of low value, means to connect the third pipe with any of the retorts, a vertical pipe for every retort, branch pipes on each vertical pipe, one of which leads to the bottom of one retort and the other of which leads to the top of the next following retort, valves in the branch pipes, the upper end of each vertical pipe being open to atmosphere, means to close such upper ends, a vessel for each vertical pipe, the lower end of each vertical pipe dipping to the bottom of its vessel.

5. A carbonizing apparatus comprising, a series of closed retorts, a heating chamber common to all the retorts, a high value gas reservoir and a low value gas reservoir, two longitudinal pipes each communicating with one of the reservoirs, means to connect each of the pipes with any of the retorts, a third longitudinal pipe connected with the reservoir for gas of low value, means to connect the third pipe with any of the retorts, a vertical pipe for each retort, branch pipes on each vertical pipe, one branch pipe leading

to the bottom of one retort and the other branch pipe leading to the top of the next following retort, control valves in the branch pipes, the upper end of each vertical pipe being open to atmosphere, means to close such upper end, a first vessel for each vertical pipe into which the lower end of the vertical pipe dips to the bottom, a second vessel under each retort, a drain pipe projecting from each retort and reaching to the bottom of its second vessel, the first and second vessels forming seals due to condensed tarry substances running down the vessel pipes.

6. A carbonizing apparatus comprising, a series of closed retorts, a heating chamber common to all the retorts, two reservoirs and two longitudinal pipes communicating with said reservoirs respectively for high and low value gas, means to connect each of the pipes with any of the retorts, a third longitudinal pipe connected with the reservoir for gas of low value, means to connect the third pipe with any of the retorts, a vertical pipe for each retort, branch pipes on each vertical pipe, one branch pipe leading to the bottom of one retort and the other branch pipe leading to the top of the next following retort, control valves in the branch pipes, a third branch on each of the vertical pipes, and means to connect it either with the third longitudinal pipe or with the common chamber, and a closure means for the third branch.

7. A furnace comprising, a plurality of retorts, a common heating chamber for the retorts, means for separating gases evolved of higher value from gases of lower value, means for separately accumulating these gases, and means for using the gases of lower value for heating said retorts.

8. A furnace for distilling fuel, comprising, a plurality of retorts, a heating chamber common to said retorts, means to force fresh air through the chamber, means to introduce gases of combustion and to guide these gases around the retorts for producing gas of value, and means to introduce the combustion gases into the next following retorts of lower temperature so as to directly heat the material therein for producing merely watery vaporous constituents.

9. A carbonizing apparatus comprising, a series of retorts, a heating chamber common to all the retorts, a reservoir, systems of pipes to separately convey high value gas produced in the retorts into the reservoir, and low value gas into the heating chamber, valves in the systems of pipes for connecting the retorts in consecutive order with the systems of pipes, an air channel, a blower for forcing air into the air channel, means to connect the air channel with the heating chamber, and means to connect the heating chamber with any of the retorts.

10. A distilling furnace comprising, a series of retorts, a heating chamber common to all the retorts, high and low value gas reservoirs, two longitudinal pipes each communicating with one of the reservoirs, means to connect the pipes with any of the retorts, a third longitudinal pipe connected with the reservoir for gas of low value, means to connect the third pipe with the retorts, an air channel, a blower for forcing air into the air channel, means to connect the air channel with the heating chamber, and means to connect the heating chamber with any of the retorts.

11. A carbonizing apparatus comprising, a series of retorts, a heating chamber common to all the retorts, high and low value gas reservoirs, two longitudinal pipes each communicating with a reservoir, means to connect the pipes with any of the retorts, a third longitudinal pipe connected with the reservoir for gas of low value, means to connect the third pipe with any of the retorts, a vertical pipe for each retort, branch pipes on each vertical pipe one branch pipe leading to the bottom of one retort and another branch pipe leading to the top of the next following retort, valves in the branch pipes, an air channel, a blower for forcing air into the air channel, means to connect the air channel with the heating chamber, and means to connect the heating chamber with any of the retorts.

12. A carbonizing apparatus comprising, a series of retorts, a heating chamber common to all the retorts, high and low value gas reservoirs, two longitudinal pipes each communicating with a reservoir, means to connect each pipe with any of the retorts, a third longitudinal pipe connected with the reservoir for gas of low value, means to connect the third pipe with any of the retorts, a vertical pipe for each retort, branch pipes on each vertical pipe one branch pipe leading to the bottom of one retort and another branch pipe leading to the top of the next following retort, valves in the branch pipes, the upper end of each vertical pipe being open to atmosphere, means for closing these upper ends, a vessel for each vertical pipe and receiving each the lower end of a vertical pipe reaching to the bottom of the vessel, an air channel, a blower for forcing air into the air channel, means to connect the air channel with the heating chamber, and means to connect the heating chamber with any of the retorts.

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